IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:	Zinsmeyer
Serial No.:	10/786,688
Filed:	February 25, 2004
Group Art Unit:	3748
Examiner:	Trieu, Theresa
Title:	LUBRICATION SYSTEM FOR COMPRESSOR

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APPEAL BRIEF

Dear Sir:

Appellant submits this revised Appeal Brief pursuant to the Notice of Appeal filed December 4, 2008 and Notice of Non-Compliance mailed January 23, 2009. Appellant has corrected the grounds for rejection and argument section to include specific reference to all the claims. No additional fees are believed due however, any additional fees or credits may be charged or applied to Deposit Account No. 03-0835 in the name of Carrier Corporation.

REAL PARTY IN INTEREST

The real party in interest is Carrier Corporation, assignee of the present invention.

RELATED APPEALS AND INTERFERENCES

There are no prior or pending appeals, interferences or judicial proceedings related to this appeal, or which may directly affect or may be directly affected by, or have a bearing on, the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 1-3, and 5-17 are pending, stand rejected and are appealed. Claim 4 is cancelled.

STATUS OF AMENDMENTS

All amendments have been entered.

SUMMARY OF CLAIMED SUBJECT MATTER

A screw compressor includes screws with mating helical teeth that engage during rotation to progressively decrease a space therebetween to compress gas between an inlet and an outlet. The screws are supported on each end by bearing assemblies that require lubricant such as oil. In some compressor configurations different amounts of lubricant flow are desired and therefore require differently sized orifices at additional expense.

The disclosed and claimed screw compressor assembly 10 includes inlet bearing assemblies 12 and outlet bearing assemblies 14 that support rotation of screws 16 driven by a motor 18. A lubrication system 11 within the compressor assembly 10 includes flow passages 20 that supply lubricant to the inlet and the outlet bearing assemblies 12,14. The flow passages 20 include a choke orifice 24 for controlling lubricant flow to at least one of the inlet and outlet bearing assemblies 12,14. The choke orifice 24 provides the desired pressure drop to reduce the flow of lubricant to the inlet bearing assemblies 12. (Page 3, line 15 to Page4, line 8, paragraphs 15 and 16, Figures 1 and 2).

The flow passage 20 includes a primary portion 26, an outlet portion 28 and an inlet portion 30. The choke orifice 24 is disposed within the inlet portion 30 to provide the desired lubricant flow to the inlet bearing assemblies 12. The flow passages 20 communicate lubricant

from a lubricant supply reservoir 32 and oil pump 34. (Page 4, lines 14-17, paragraph 18, Figures 1 and 2).

The example lubrication system 11 includes three inlet bearing assemblies 12 and three outlet bearing assemblies 14. Each of the bearing assemblies 12,14 is mounted within a cavity 40. The flow passage 20 includes the primary portion 26 that branches into the outlet portion 28 and inlet portion 30. Lubricant flow within the primary portion 26 is the sum of lubricant flow rates in outlet portion 28 and inlet portion 30. (Page 5, lines 14-18, paragraph 22, Figure 2).

The inlet portion 30 of flow passages 20 includes a flow passage branching from primary portion 26 leading to choke orifice 24, the flow passage through orifice 24, three passages leading to orifices 42, flow passages through each orifice 42, and passages from each orifice 42 to each bearing cavity 40 containing a inlet bearing assembly 12. The inlet portion 30 includes lubricant at a reduced flow rate as is dictated by the specific size of the choke orifice 24 in concert with the size of the inlet portion 30 of the flow passage 20. (Page 5, line 19 to Page 6, line 2, paragraph 22, Figure 2).

Lubricant flow rate in inlet portion 30 is determined by flow-restricting action of choke orifice 24 in concert with flow-restricting action of orifices 42.

The orifices 42 in inlet portion 30 are disposed downstream of the choke orifice 24. The choke orifice 24 in combination with the orifices 42 in inlet portion 30 provides the desired flow to each of the inlet bearing assemblies 12. Orifices 42 in outlet portion 28 provide the desired flows to each of the outlet bearing assemblies 14. The use of the choke orifice 24 to provide the preferred flow rate to inlet bearings provides for a common orifice flow passage size to be used for all orifices 42. (Page 6, line 19 to Page 7, line4, paragraph 26, Figures 2-4).

The disclosed and claimed compressor includes the lubrication control system that includes a choke orifice for proportionally allocating lubricant between the inlet and outlet bearing assemblies. The proportional allocation provides optimal lubrication for each of the bearing assemblies, without complicating manufacture and assembly by using orifices with flow passages of different sizes. Furthermore, while the preferred lower flow rates to inlet bearings could be achieved by using orifices in inlet portion 30 that have smaller sized flow passages than

orifices in outlet portion 28, the passage sizes required would be so small that they would be prone to clogging by debris entrained in the lubricant flow. In contrast, the orifice sizes required to achieve preferred flow rates when a choke orifice is used are larger and therefore less prone to clogging by debris. (Page 7. lines 5-14, paragraph 27).

Claim 1

Claim 1 recites a compressor assembly 10 comprising an inlet bearing 12 supplied with lubricant through an inlet orifice and an outlet bearing 14 supplied with lubricant through an outlet orifice. A rotating compressor member 16 is supported for rotation on an inlet end by the inlet bearing 12 and on an outlet end by the outlet bearing 14. (Page 3, line 15 to Page 4, line 2, paragraph 15, Figure 1). A plurality of flow passages 20 supply lubricant to the inlet and outlet orifices 42 and a choke orifice 24 is disposed in series with the inlet orifice 42. The choke orifice 24 changes a lubricant flow rate to the inlet bearing 12 relative to a lubricant flow rate to the outlet bearing 14 from the outlet orifice, wherein each of the choke orifice 24, the inlet orifice 42 and the outlet orifice 42 comprise a flow area substantially smaller than any of the plurality of flow passages 20. (Page 5, line 14 to Page 6, line 2, paragraph 22, Figures 1 and 2)

Claim 9

Claim 9 recites a screw compressor assembly comprising a motor 18 driving screw rotors 16 with an outlet bearing 14 supporting an outlet side of the screw rotors 16 and an inlet bearing 12 supporting an inlet side of the screw rotors 16. (Page 3, line 15 to Page 4, line 2, paragraph 15, Figure 1)Flow passages comprise an inlet orifice 42 for supplying lubricant to the inlet bearing 12, an outlet orifice 42 for supplying lubricant to the outlet bearing 14 and a choke orifice 24 in series with the inlet orifice 42 for controlling the flow of lubricant to the inlet orifice 42 relative to the flow of lubricant to the outlet orifice 42, wherein the flow passage 20 comprises a substantially larger flow area than any of choke orifice 24, the inlet orifice and the outlet orifice. (Page 5, line 14 to Page 6, line 2, paragraph 22, Figures 1 and 2)

Claim 12

Claim 12 recites a screw compressor assembly comprising a motor 18 driving screw rotors 16 with an outlet bearing 14 supporting an outlet side of the screw rotors 16 and an inlet bearing 12 supporting an inlet side of the screw rotors 16. (Page 3, line 15 to Page 4, line 2, paragraph 15, Figure 1) An inlet orifice 42 supplies lubricant to the inlet bearing and an outlet orifice 42 supplies lubricant to the outlet bearing 14. (Page 5, line 14 to Page 6, line 2, paragraph 22, Figures 1 and 2). A primary portion 26 including a primary passage for feeding lubricant to an inlet portion 30 and an outlet portion 28; and a choke orifice 24 in series with the inlet orifice 42 for controlling the flow of lubricant to inlet orifice 42, wherein the choke orifice 24 is disposed within the inlet portion 30 and a flow area of each of the choke orifice 24, the inlet orifice 42 and the outlet orifice 42 is substantially smaller than any portion of the primary passage 26. (Page 4, lines 14-22, paragraphs 18-19, Figure 2).

GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

(1) Is the rejection of Claims 1-3, 5, 6, 8, 9-13, 15 and 16 under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 5,411,385 to Eto et al. ("Eto") in view of U.S. Patent No. 4,173,440 to Libis ("Libis") improper?

(2) Is the rejection of Claims 7 and 14 under 35 U.S.C. § 103(a) as being obvious over Libis in view of U.S. Patent No. 3,260,444 to Williams et al. ("Williams") improper?

(3) Is the rejection of claim 15 and 16 under 35 U.S.C. § 103(a) as being obvious over Eto in view of Libis improper?

(4) Is the rejection of Claim 17 under 35 U.S.C. § 103(a) as being obvious over Eto in view of Libis improper?

ARGUMENT

(1) The rejection of Claims 1-3, 5, 6, 8, and 9-13 as being obvious over Eto in view of Libis is improper.

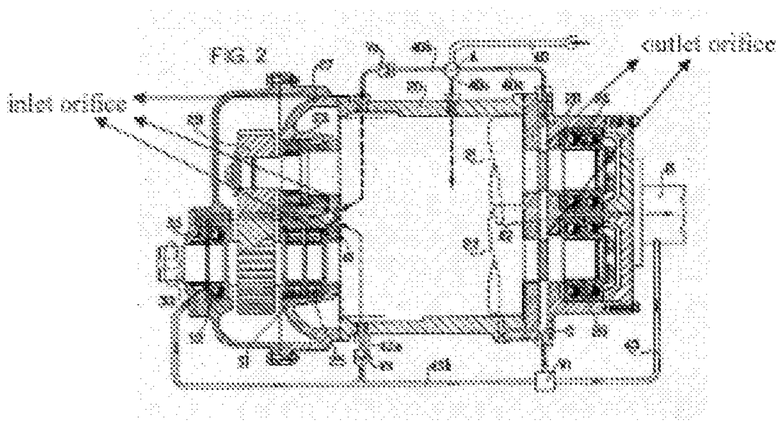
Claim 1

The Examiner's argues that Eto discloses all the features of claim 1, except for the inlet orifice and the outlet orifice, and that Libris discloses these features. Appellant disagrees.

Claim 1 requires an inlet bearing supplied with lubricant through an inlet orifice, an outlet bearing supplied with lubricant through an outlet orifice and a choke orifice in series with the inlet orifice. Claim 1 further requires that each of the inlet orifice, the outlet orifice and the choke orifice are smaller than any of the plurality of flow passages. The combination of Eto and Libis does not disclose nor suggest these features.

Instead, Eto discloses a device that includes a single orifice "Of" (Eto Figure 2) but does not disclose that the orifice "Of" is disposed in series with either an inlet orifice or an outlet orifice. The Examiner is reading the "Of" orifice in Eto Figure 2 as the claimed choke orifice. However, Eto fails to disclose the claimed inlet and outlet orifices. For this reason the Examiner argues that in Libis discloses the claimed inlet and outlet orifices and is properly combinable with Eto.

However, this is not the case as all that Libis teaches are flow passages to the respective bearings. The Examiner argues that passages in Libis disclose the claimed inlet and outlet passages. The Examiner provided the below marked Figure 2 from the Libis reference to support the argument that Libis disclosed an inlet and outlet orifice and that such orifices were smaller than the plurality of flow passages.



However, as shown, the Examiner is simply pointing to specific oil passages, not to any orifice. Further, the Examiner does not refer to any portion of the Libis specification to support the argument that the passages referred include an orifice. The Libis passages pointed to by the Examiner clearly do not disclose any orifice. Instead, the features indicated by the Examiner are branch passages that supply lubricant to the bearings. Nothing in Libis supports any reading that these passages include orifices.

In fact as is shown in the above Figure 2 of the Libis reference, much of the oil passages are schematically represented by dashed lines. How can any reading be supported by the schematic representation of most of the lubricant passages? Appellant appreciates that the Examiner is permitted to broadly interpret prior art references. However, any such interpretation cannot be contrary to the understanding of one skilled in the art. In this instance, the disclosed passages in Libris would not be understood as the recited orifices.

Further, the Libis device discloses valves (V2, V3) that are disposed within the passages referred to by the Examiner. The use of valves teaches away from the use of orifices, as the valves would control the amount of flow, rather than utilizing a fixed orifice. Further, the passages referred to by the Examiner are referred to as pipes (41, 42, Col 3, lines 50-68 of Libis).

Such a description of the passages as pipes certainly does not support the Examiner's reading that the recited passages meet the claimed limitation of an orifice.

Further, claim 1 requires that each of the inlet and outlet orifices include a flow area smaller than any of the plurality of passages. As the relied on features are in fact passages and not orifices, they cannot meet the limitation requiring that the inlet and outlet orifice include a flow area smaller than any of the plurality of flow passages. Further, the size of the passages referred to by the Examiner is not clear as only a cross-section is shown, and no explanation or description is present that refers to the Libis passages. These same passages could be quite large in a plane not illustrated by Figure 2 of Libis.

Additionally, Eto provides orifices in a side block and therefore eliminates problems associated with installing separate orifice devices within each of the passages. The orifice (Of) is disclosed as an integral part of the passage. Further, Eto states that it is undesirable to provide separate orifice devices that are plugged into passages. (Please see Eto, Col 3, lines 25-50). Libis on the other had does not even disclose orifices.

However, the addition of other orifices to the Eto device is counter to the purpose and object of Eto to eliminate the need for several orifice devices by using only one orifice that is integral with the side block. (Please see Eto, Col 5, lines 20-30). For this reason, the combination of Eto to include additional orifices is not proper, and not suggested.

Although there is no rigid standard concerning a proposed modification of a base reference, any such combination must still be supported by some reason. There can be no reason if the proposed modification would destroy the desired operation and purpose of the base reference. In this instance, the proposed modification of Eto to include additional orifices is not proper and would destroy a stated and intended purpose of Eto. (Eto, Col 5, Lines 25-30).

Accordingly, for at least these reasons Appellant requests reversal of this rejection.

<u>Claim 9</u>

Claim 9 requires an inlet orifice for supplying lubricant to the inlet bearing and an outlet orifice for supplying oil to the respective bearings, and a choke orifice in series with the inlet

orifice. Claim 9 further requires that each of the inlet, outlet and choke orifices is of a size smaller than any of the flow passages. Claim 9 includes the additional limitation of a motor driving screw rotors.

As discussed above with regard to claim 1, the proposed combination does not include the claimed orifice configuration. Instead, Eto simply discloses one orifice (Of) that is not in series with an inlet or outlet orifice. Libis does not disclose the inlet and outlet orifice for the reasons discussed in detail above. Accordingly, claim 9 recites features that are not disclosed nor suggested by the proposed combination, and this rejection should be reversed.

Claim 12

Claim 12 requires that the lubricant passage include a primary passage for feeding lubricant to an inlet portion and an outlet portion, and that the choke orifice is disposed in the inlet portion. Claim 12 further requires that the choke orifice be disposed in series with the inlet orifice. As discussed with regard to claims 1 and 9 above, the proposed combination does not disclose all the claimed features. Eto does not disclose a choke orifice in series with an inlet orifice. Libis doe not disclose this feature either for the reasons detailed above. For at least this reason, the proposed combination is not proper, and the rejections based on this combination should be reversed.

Dependent Claims

Claims 2 and 10 require that the inlet orifice and the outlet orifice be of a common size. The Libis reference does not disclose this feature. Nothing in Libis discloses that the inlet and outlet orifice are the same size. In fact, the shape of the Libis outlet passages as indicated by the Examiner in the Libis Figure 2 provided above, shows that the passages read as the inlet orifice are much different than those read as the outlet orifice.

(2) The rejection of Claims 7 and 14 as being obvious over Libis in view of Williams is improper.

The base combination of Eto and Libis fails to disclose or suggest all the claimed features and the addition of Williams does not correct these deficiencies. Further, claims 7 and 14 require a lube block with a portion of the flow passage as recited in claims 1 and 9 respectively. Williams discloses a fitting 160 that includes an orifice. However, that fitting is not a lube block, now would such a fitting suggest a lube block. Accordingly, for at least these reasons, the rejection to claims 7 and 14 should be reversed.

(3) The rejection of claims 15 and 16 as being obvious over Eto in view of Libis is improper.

Claim 15 depends from claim 9 and further requires that there are three inlet and outlet bearing assemblies and three inlet and outlet orifices with the choke orifice in series with the three inlet orifices. The Examiner argues that this is a mere duplication of parts. However this claim specifically requires that the choke orifice is in series with the three inlet orifices. This feature is not disclosed in the proposed combination for the reasons discussed above with regard to claims 1 and 9.

Claim 16 also depends from claim 16 and requires that lubricant flow to the inlet bearing assemblies is less than lubricant flow to the outlet bearing assemblies. The Examiner did not cite to any features in the proposed combination that disclosed this feature and merely grouped this rejection with that of claim 15. Clearly, claim 16 is not a duplication of parts.

Claims 15 and 16 depends from claim 9, that is allowable for the reasons discussed above with regard to claims 1 and 9. Accordingly, claims 15 and 16 are also in allowable form.

(4) The rejection of Claim 17 as being obvious over Eto in view of Libis is improper.

Claim 17 depends ultimately from claim 9, and requires that the amount of lubricant flow to the inlet bearing is no more than $1/5^{th}$ the flow rate of lubricant to the outlet bearing. The rejection to claim 9 is improper as the proposed combination is improper and fails to disclose the

recited features. Accordingly, for the reasons discussed with regard to claim 9, the rejection of claim 17 should also be reversed.

CONCLUSION

For the reasons set forth above, the rejection of claims 1-3, and 5-17 is improper and should be reversed. Appellant earnestly requests such an action.

Respectfully Submitted,

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CLAIMS APPENDIX

1. A compressor assembly comprising:

an inlet bearing supplied with lubricant through an inlet orifice;

an outlet bearing supplied with lubricant through an outlet orifice;

a rotating compressor member supported for rotation on an inlet end by said inlet bearing and on an outlet end by said outlet bearing;

a plurality of flow passages for supplying lubricant to said inlet and outlet orifices; and

a choke orifice disposed in series with said inlet orifice for changing a lubricant flow rate to the inlet bearing relative to a lubricant flow rate to the outlet bearing from said outlet orifice, wherein each of the choke orifice, the inlet orifice and the outlet orifice comprise a flow area substantially smaller than any of the plurality of flow passages.

2. The assembly as recited in claim 1, wherein said inlet orifice and said outlet orifice are of a common size.

3. The assembly as recited in claim 2, wherein said flow passages comprise a primary portion feeding lubricant to an inlet portion and an outlet portion.

5. The assembly as recited in claim 1, wherein a flow rate of lubricant to said inlet orifice is lower than a flow rate of lubricant to said outlet orifice.

6. The assembly as recited in claim 1, wherein said compressor assembly comprises a screw compressor.

7. The assembly as recited in claim 1, comprising a lube block defining a portion of said flow passage, wherein said choke orifice is disposed within said lube block.

8. The assembly as recited in claim 1, wherein a portion of said flow passage comprises tubing mounted to said compressor.

9. A screw compressor assembly comprising:

a motor driving screw rotors;

an outlet bearing supporting an outlet side of said screw rotors ;

an inlet bearing supporting an inlet side of said screw rotors;

a flow passage comprising an inlet orifice for supplying lubricant to said inlet bearing, an outlet orifice for supplying lubricant to said outlet bearing; and

a choke orifice in series with said inlet orifice for controlling the flow of lubricant to said inlet orifice relative to the flow of lubricant to the outlet orifice, wherein the flow passage comprises a substantially larger flow area than any of said choke orifice, said inlet orifice and said outlet orifice.

10. The assembly as recited in claim 9, wherein said inlet orifice and said outlet orifice are of a common size.

11. The assembly as recited in claim 10, wherein said flow passage comprises a primary portion feeding lubricant to an inlet portion and an outlet portion.

12. A screw compressor assembly comprising:

a motor driving screw rotors;

an outlet bearing supporting an outlet side of said screw rotors;

an inlet bearing supporting an inlet side of said screw rotors;

an inlet orifice for supplying lubricant to said inlet bearing;

an outlet orifice for supplying lubricant to said outlet bearing;

a primary portion including a primary passage for feeding lubricant to an inlet portion and an outlet portion; and

a choke orifice in series with said inlet orifice for controlling the flow of lubricant to said inlet orifice, wherein said choke orifice is disposed within said inlet portion and a flow area of each of the choke orifice, the inlet orifice and the outlet orifice is substantially smaller than any portion of said primary passage.

13. The assembly as recited in claim 12, wherein a flow rate of lubricant within said inlet portion is lower than a flow rate of lubricant within said primary portion.

14. The assembly as recited in claim 9, comprising a lube block defining a portion of said flow passage, wherein said choke orifice is disposed within said lube block.

15. The assembly as recited in claim 9, comprising three inlet and outlet bearing assemblies, and three inlet and outlet orifices, wherein said choke orifice is in series with said three inlet orifices.

16. The assembly as recited in claim 15, wherein a lubricant flow rate to said inlet bearing assemblies is less than a lubricant flow rate to said outlet bearing assemblies.

17. The assembly as recited in claim 16, wherein said lubricant flow rate to said inlet bearing assemblies is no more than $1/5^{th}$ said lubricant flow rate to said outlet bearing assemblies.

Evidence Appendix

None

Related Proceedings Appendix

None